

	A
1	
2	<b>Parameter/Method</b>
3	<b>Alcohols:</b> Ethanol, methanol, 1-propanol, 1-butanol, 2-butanol (8015D)
4	<b>Alpha Spec</b> (Th-228, Th-230, Th-232) (DOE HASL 300)
5	<b>Alpha Spec</b> (U-234, U-235, U-236, U-238) (DOE HASL 300)
6	<b>Anions:</b> Chloride, Bromide, Fluoride, Orthophosphorus as P, Sulfate as SO4 (300.0)
7	<b>Bacteria (fecal &amp; total coliform, HPC)</b> (SM 9222B; SM 9215B w/R2A medium)
8	<b>Dissolved Gases</b> , Methane, Ethane, Ethene, Propane, Butane (RSK-175, or equiv - EPA R9 SOP 325)
9	<b>DRO</b> (8015M, or equiv-EPA R9 SOP 385)
10	<b>Ethylene Glycol</b> (8015M)
11	<b>Gamma Spec</b> Bi-212, Bi-214, K-40, Ra-226, Ra-228, Th- 232, Th-234, U-234, U-235, U-238 (901.1)

	A
12	<b>Glycols incl. 2-Butoxyethanol</b> (Modified 8321)
13	<b>GRO</b> (8015M, or equiv-EPA R9 SOP 380)
14	<b>Gross Alpha/Beta</b> (900.0)
15	<b>Isotech</b> - d13C and d2H of methane; - Complete compositional analysis of headspace gas; - Stable isotopes of water (O,H)
16	<b>Metals Dissolved:</b> Al, As, B, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Li, Mg, Mn, Na, Ni, Sb, Se, Sn, Sr, Ti, Tl, U, V, Zn (200.7/200.8/245.1)
17	<b>Metals:</b> Al, As, B, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Li, Mg, Mn, Na, Ni, Sb, Se, Sn, Sr, Ti, Tl, U, V, Zn (200.7/200.8/245.1)
18	<b>Methylene Blue Active Substances (MBAS)</b> (SM 5540C)
19	<b>Oil &amp; Grease (HEM)</b> (1664A)
20	<b>PAH SIM</b> (8270C)
21	<b>Ra-226</b> (903.1)

	A
22	<b>Ra-228</b> (904.0)
23	<b>Semi-Volatiles (TCL plus TICs)</b> (OLC03.2)
24	<b>Solids, Total Dissolved (TDS)</b> (SM 2540C)
25	<b>Solids, Total Suspended (TSS)</b> (SM 2540D)
26	<b>Volatiles + Acrylonitrile (TCL + TICs)</b> (OLC03.2)
27	<b>Wet Chemistry:</b> - Phosphorus, Total (365.4); - Nitrate/Nitrite (353.2); - Nitrogen; Total (353.2)
28	
29	<b>Alkalinity</b>
30	<b>Dissolved sulfide</b>
31	<b>Ferrous iron</b>
32	<b>Turbidity</b>
33	

	A
34	C14 isotope (biogenic v. thermo)
35	$\delta^{13}\text{C}$ of inorganic carbon
36	$^{87}\text{Sr}/^{86}\text{Sr}$ analysis
37	
38	
39	
40	
41	

	B
1	
2	<b>Rationale for Parameter/Method Analyzed</b>
3	Potential indicator of components from hydraulic fracturing operations. Methanol is used on 342 products, (Table 3 of Congressional Report). 1-butanol is on the EPA Contaminant Candidate List 3.
4	Recommended by ERT Newhart. Potential indicator of components from hydraulic fracturing operations.
5	Recommended by ERT Newhart. Potential indicator of components from hydraulic fracturing operations.
6	Potential indicator of components from hydraulic fracturing operations. Bromides, for instance, have been reportedly elevated in water bodies where hydraulic fracturing waters have been discharged. Bromine is a common constituent of biocides which have been reported to be added to the fracturing fluid in order to inhibit bacterial growth.
7	HPC was recommended by OSC Rupert per inclusion on end of Excel file containing list of chemicals reported to be used in hydraulic fracturing operations within the Congressional Report.
8	Potential indicator of components from hydraulic fracturing operations as these are components of produced natural gas. May be helpful in determining thermogenic vs biogenic origins of dissolved gas.
9	Potential indicator of components from hydraulic fracturing operations. Diesel is used in 51 products (Table 3 of Congressional Report). Companies injected more than 30 million gallons of diesel fuel or hydraulic fracturing fluids contained diesel fuel in wells in 19 states. (Congressional Report)
10	Potential indicator of components from hydraulic fracturing operations. Ethylene Glycol is used in 119 products (Table 3 of Congressional Report). Ethylene Glycol is on the EPA Contaminant Candidate List 3.
11	Bi-212 and B-214 recommended by ERT Newhart. Potential indicator of components from hydraulic fracturing operations.

	B
12	Potential indicator of components from hydraulic fracturing operations. 2-Butoxyethanol is used as a "foaming agent or surfactant" per Congressional Report.
13	TPH as gasoline is listed as a critical analyte on Table 2 of the GWERD QAPP.
14	Potential indicator of components from hydraulic fracturing operations. Most likely result of produced brine.
15	O, H stable isotopes of water, d13C and d2H of methane was recommended by OSC Rupert per inclusion on end of Excel file containing list of chemicals reported to be used in hydraulic fracturing operations within the Congressional Report. May be helpful in determining thermogenic vs biogenic origins of dissolved gas. This analysis is different than the RSK-175 Method. To analyze for d13C and d2H of methane, there has to be at least 2% methane present. To determine if there is 2% methane in the sample, the "complete compositional analysis of headspace gas" has to be analyzed first. This is being done in an attempt to determine what geologic formation the natural gas came from - the formation where the fracking is being done or a shallower source that may not be related to the drilling/fracking.
16	One or more of the metals is listed as a critical analyte on Table 2 of the GWERD QAPP. Dissolved metals concentrations can help with determination of treatments systems/criteria.
17	One or more of the metals is listed as a critical analyte on Table 2 of the GWERD QAPP.
18	Potential indicator of components from hydraulic fracturing operations. Method will test for anionic surfactants. Surfactants are commonly used in hydraulic fracturing operations.
19	Potential indicator of components from hydraulic fracturing operations.
20	Lower detection limit on PAHs so the results can be comparable to MCLs.
21	Recommended by OSC Rupert per inclusion on end of Excel file containing list of chemicals reported to be used in hydraulic fracturing operations within the Congressional Report. Potential indicator of components from hydraulic fracturing operations as low levels of radium are inherent in brine.

	B
22	Recommended by OSC Rupert per inclusion on end of Excel file containing list of chemicals reported to be used in hydraulic fracturing operations within the Congressional Report. Potential indicator of components from hydraulic fracturing operations as low levels of radium are inherent in brine.
23	SVOC is listed as a critical analyte on Table 2 of the GWERD QAPP.
24	Potential indicator of components from hydraulic fracturing operations. The Pennsylvania Act 2 medium specific concentrations are organized by TDS, specifically whether the result is greater or less than/equal to 2500 mg/L.
25	Water quality criteria - is indicative of certain types of contamination such as bacteria.
26	Potential indicator of components from hydraulic fracturing operations. Benzene is used in 3 products, Ethylbenzene is used in 28 products, Toluene is used in 29 products, Xylene is used in 44 products (Table 3 of Congressional Report). Is listed as a critical analyte on Table 2 of the GWERD QAPP.
27	
28	
29	Field Screening. Water quality criteria used to determine the condition of the well water.
30	Field Screening. Water quality criteria used to determine the condition of the well water.
31	Field Screening. Water quality criteria used to determine the condition of the well water.
32	Field Screening. Water quality criteria used to determine the condition of the well water.
33	Para

	B
34	Analysis was dropped from the list during a conference call between EPA, START, and Dr, Ludwig. Lab availability and costs played a role.
35	Analysis was dropped from the list during a conference call between EPA, START, and Dr, Ludwig. Lab availability and costs played a role.
36	Analysis was dropped from the list during a conference call between EPA, START, and Dr, Ludwig. Lab availability and costs played a role.
37	
38	
39	
40	
41	



	C	D
1		
2	EPA Pavillion Report - December 2011	Contains Enforceable/Regulated Parameters?
3		
4		
5		
6		MCL
7		MCL
8		
9	Diesel oil (mixture of saturated and aromatic hydrocarbons including naphthalenes and alkylbenzenes) was used in a guar polymer slurry/liquid gel concentrate (30-60%) and in a solvent (60-100%). Petroleum raffinates (mixture of paraffinic, cycloparaffinic, olefinic, and aromatic hydrocarbons) was used in a breaker (<30-60%). Heavy aromatic petroleum naptha (mixture of paraffinic, cycloparaffinic and aromatic hydrocarbons) was used in surfactants (5-10%, 10-30%, 30-60%) and in a solvent (10-50%). (Table 4 of EPA Report on Pavillion)	
10		PA ACT-2
11		

	C	D
12	Diethylene glycol was used in a foaming agent (5-10%) and in a solvent (0.1-5%). Triethylene glycol was used in a solvent (95-100%). 2-butoxyethanol was used in a surfactant (10-30%), in foaming agents (<10%, <11%, <12%, 1-10%, 10-30%) and in solvents (15-40%, 60-100%). (Table 4 of EPA Report on Pavillion)	
13		
14		
15		
16		MCL
17		MCL
18		
19		
20		RSL
21		MCL

	C	D
22		MCL
23		MCL
24		PA ACT-2; Secondary Drinking Water Reg
25		
26	Aromatic solvent (typically BTEX mixture) was used in a breaker (<75%). Diesel oil (mixture of saturated and aromatic hydrocarbons including naphthalenes and alkylbenzenes) was used in a guar polymer slurry/liquid gel concentrate (30-60%) and in a solvent (60-100%). Petroleum raffinates (mixture of paraffinic, cycloparaffinic, olefinic, and aromatic hydrocarbons) was used in a breaker (<30-60%). Heavy aromatic petroleum naptha (mixture of paraffinic, cycloparaffinic and aromatic hydrocarbons) was used in surfactants (5-10%, 10-30%, 30-60%) and in a solvent (10-50%). Toluene was used in a flow enhancer (3-7%). Xylenes were used in a flow enhancer (40-70%) and a breaker (confidential percentage). (Table 4 of EPA Report on Pavillion)	MCL
27		PA PQL
28	<b>Field Screening</b>	
29		
30		
31		
32		MCL
33	<b>Materials Not Being Analyzed</b>	

	C	D
34		
35		
36		
37		
38		
39		
40		
41		

	E	F
1		
2	<b>Included on PADEP June 2010 Report</b>	<b>Included on Congressional April 2011 Report</b>
3	Yes	Yes
4		
5		
6		
7		
8		
9	Yes	Yes
10	Yes	Yes
11		

	E	F
12	Yes	Yes
13		
14		
15		
16		
17		
18		Yes
19		
20		
21		

	E	F
22		
23		
24		
25		
26	Yes	Yes
27		
28		
29		
30		
31		
32		
33		

	E	F
34		
35		
36		
37		
38		
39		
40		
41		